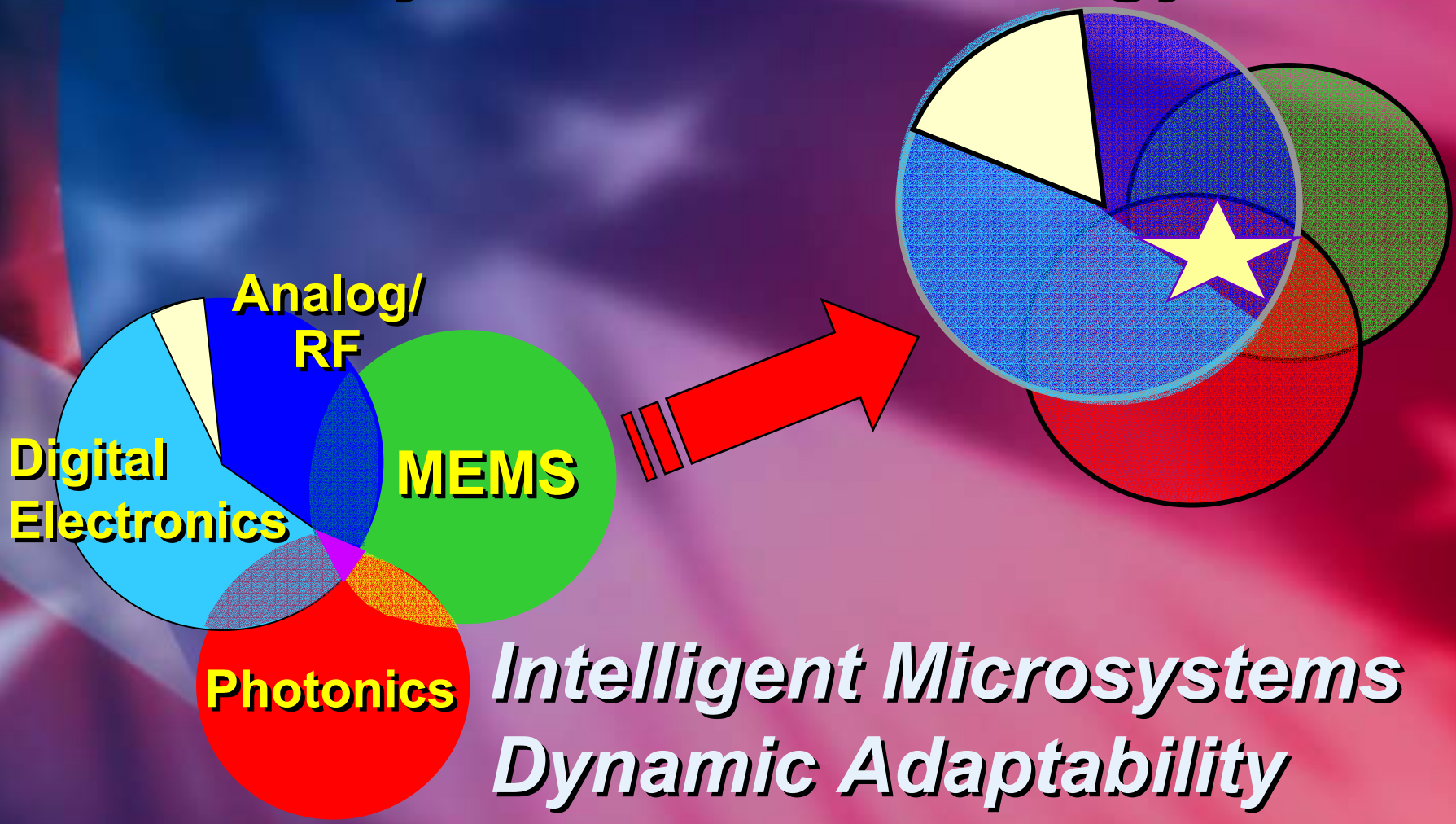

DARPA
DARPATech
2002 Symposium
Transforming
Fantasy

“It’s a Small, Small World”

Robert Leheny, Director

Microsystems Technology Office



Intelligent Microsystems
Dynamic Adaptability

Transformative Fantasy

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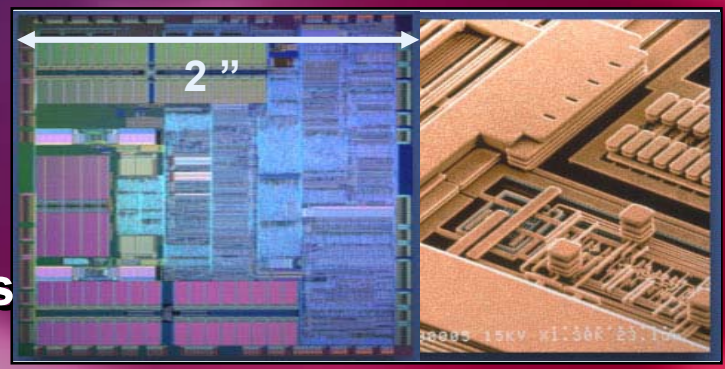
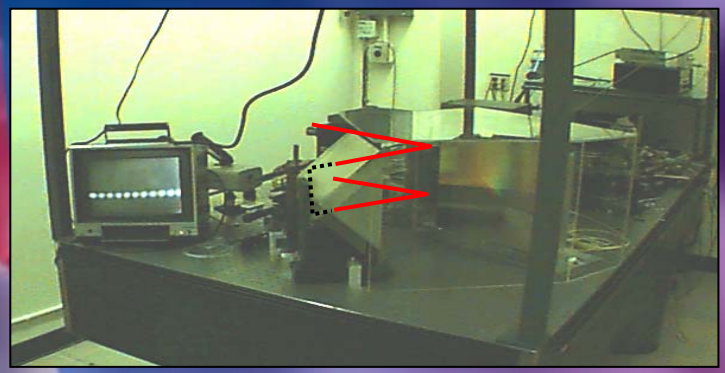
Chip-Scale Microsystems

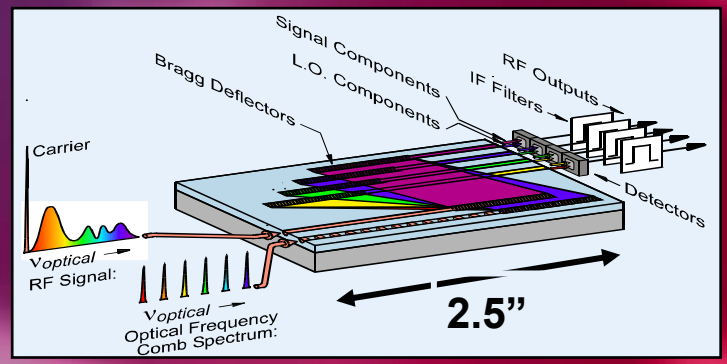
Electronics



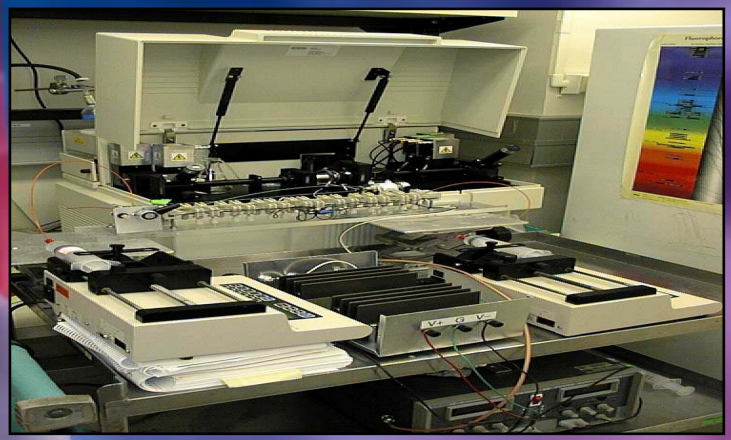
Chip-Scale Microsystems



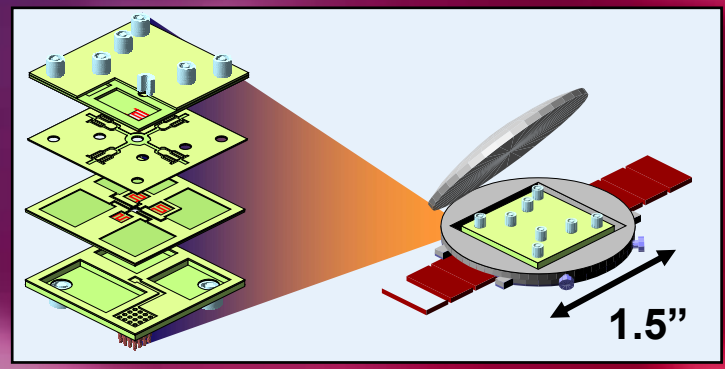
Photonics



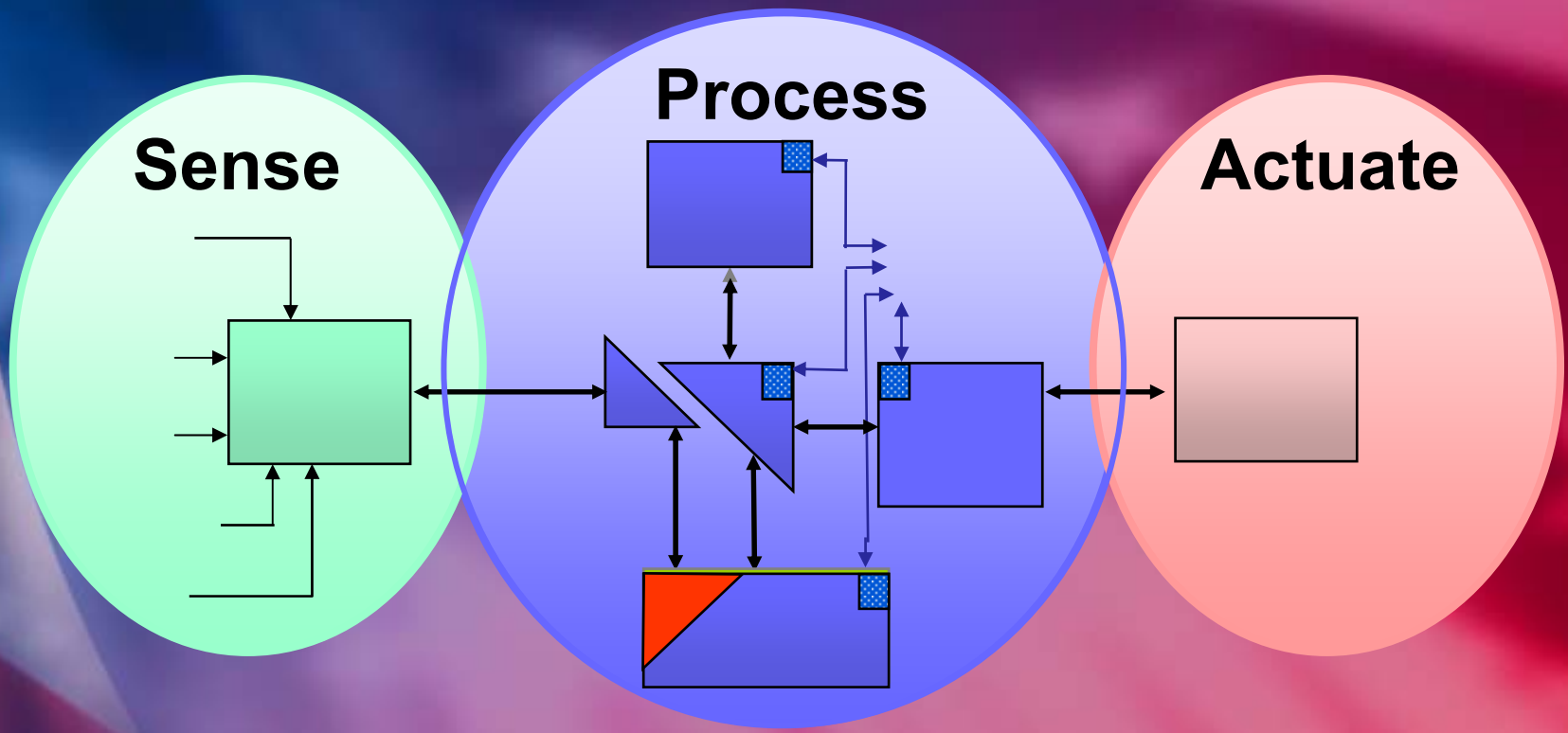
Chip-Scale Microsystems



MEMS



Platform Scale Information Systems



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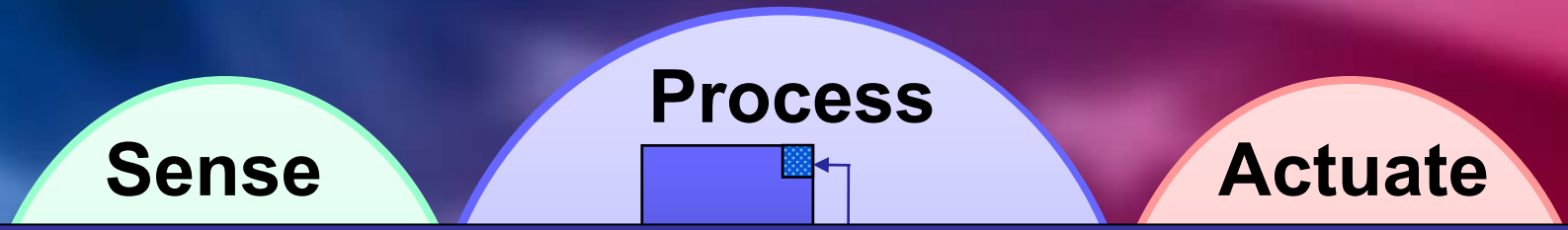
Platform Scale Information Systems



- Highly capable self adapting sensors
- Enhanced signal extraction from noise, and jamming
- Covert “data” into actionable “knowledge” in near real time

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MicroElectronic Device Technology

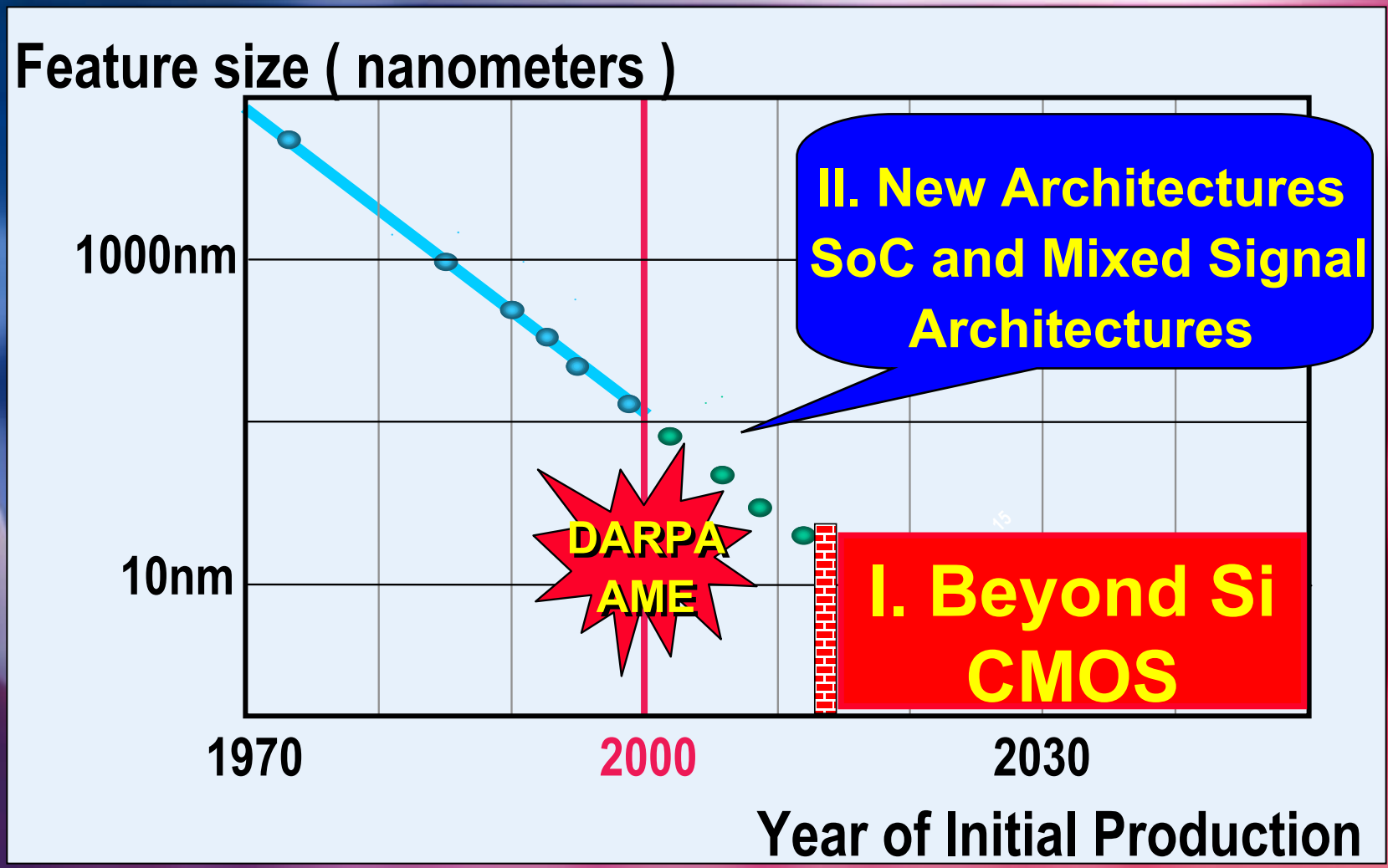
Two, Parallel Technology Evolutions

1. VLSI – Scaled CMOS

   - Increasing transistor density

MANAGING COMPLEXITY

Moore's Law


Feature size (nanometers)
1000nm
10nm
1970
2000
2030
Year of Initial Production
II. New Architectures
SoC and Mixed Signal
Architectures
DARPA
AME
I. Beyond Si
CMOS

MicroElectronic Device Technology

Two, Parallel Technology Evolutions

1. VLSI – Scaled CMOS
   - Increasing transistor density

MANAGING COMPLEXITY

2. Microwave Integrated Circuits
   - Compound Semiconductors (III-V)
   - Heterogeneous Structures

MANAGING PERCISION

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GaAs IC Market 1990-Today

- Pre - 1995 Military Applications Dominate
  - Total Value $100-200M/yr
- Post - 1995 Commercial Applications Dominate
  - Total Value >$ 1B/yr

DARPA Supported Defense Contractor Community Delivers MIMIC Technology To Commercial Wireless World

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Overcoming Scaled-CMOS Barrier

DARPA Nano - Technology Push

- MTO – Molecular Electronics
- DSO – SPiN Electronics
- DSO/IPTO – Quantum Information & Science Technology
- DSO/IPTO – Bio-Info-Micro

Challenge – Where do I plug my keyboard In?

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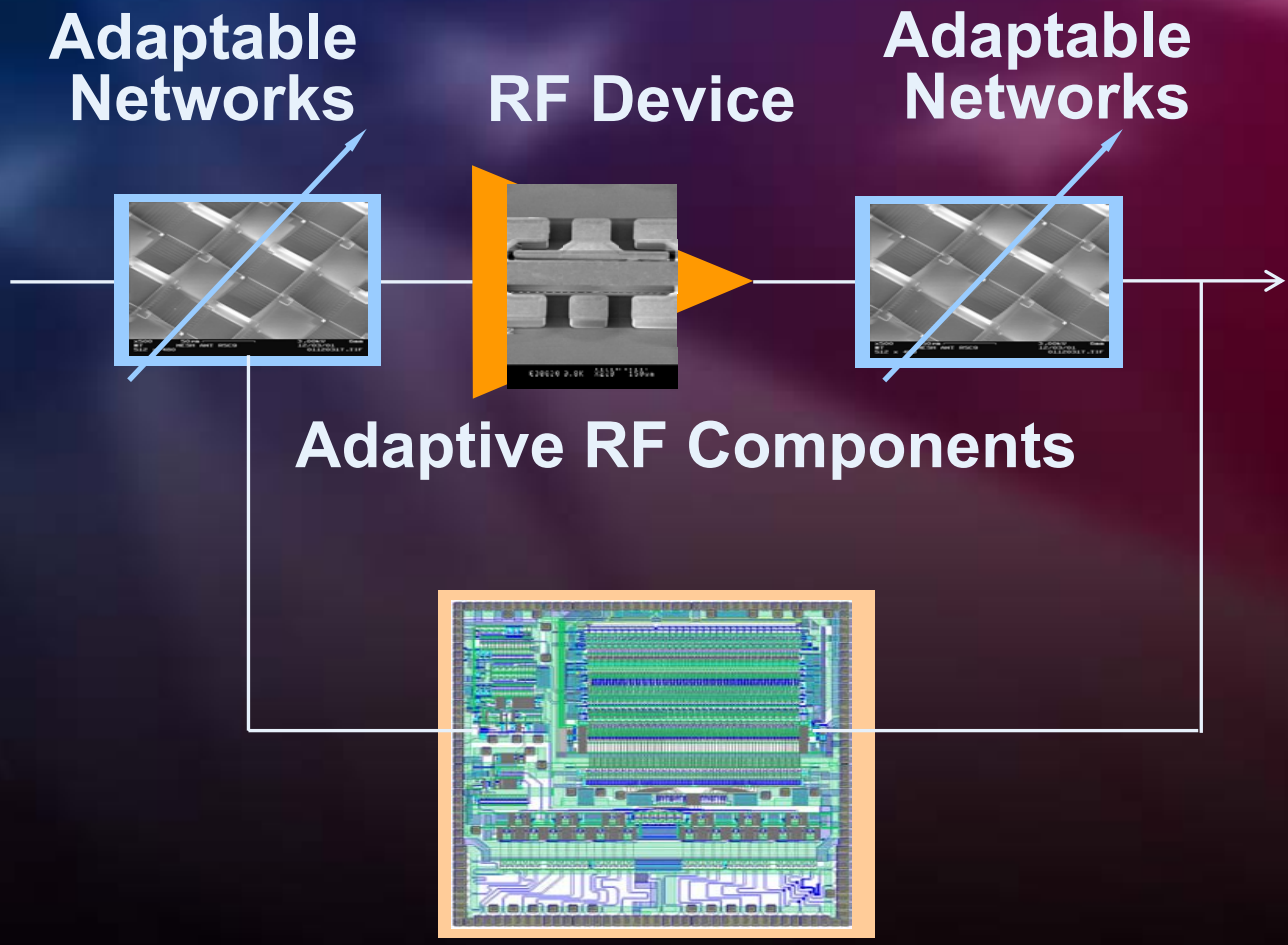
Intelligent RF Front-Ends
"Digital Control of Analog Circuits"



Technology for Efficient, Agile Mixed Signal Microsystems (TEAM)

Multi-100GHz Si-based devices compatible with CMOS for high performance, mixed signal system-on-chip

MicroElectro-Mechanical Systems

- Inertial Sensing
- Microfluidics
- Optical MEMS
- Pressure
- RF Technology

Photonics

- IR ⟶ UV Sensing
- Optical Data Communications
- RF-Lightwave Integrated Technology

MTO Presentations

Dr. David Honey (Deputy Director MTO)	"Future Opportunities for Photonic R&D"
Dr. Clark Nguyen	"Developing Micro-Electronics-Mechanical Systems Programs at MTO"
Dr. John Carrano	"Increasing the Effectiveness of Steered Agile Beams"
Dr. Edgar Martinez	"Transforming Microelectronics"
Dr. Kwan Kwok	"Moletronics: Transferring Nanotechnology and Nanocomputers to Reality"

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